9-2021

Faculty Research Profile: Dr. Vincent F. Chevrier

Lutishoor Salisbury

Jeremy Smith

Yang Tian

Congratulations to Dr. Vincent F. Chevrier on Promotion to Associate Research Professor

Assistant Research Professor

Vincent F. Chevrier

Emphasis

- Planetary sciences
- Thermodynamics
- Geochemistry
- Mineralogy

Research Interests

Focus on the Geochemistry, Mineralogy and Spectroscopy of planetary surfaces with a special emphasis on surface volatiles and their interactions with the atmosphere. Uses experimental simulations and thermodynamic or kinetic modeling of planetary surface-atmosphere interactions on Mars, Venus, Titan and Pluto. Other projects focus on the stability and dynamics of liquid water on the surface of Mars and liquid hydrocarbons on the surface of Titan, and their Astro-biological potential in terms of habitability of planetary surfaces. Research is interdisciplinary, involving mostly chemistry (organic and inorganic), geology, geomorphology and spectroscopy.

Education/Research Experience

- **2020- Present University of Arkansas, Fayetteville**
  Associate Research Professor
- **2008-2020 Present University of Arkansas, Fayetteville**
  Assistant Research Professor
- **2005-2008 University of Arkansas, Fayetteville**
  Postdoctoral Fellow: Subject of research: "State and stability of water on Mars"
- **2004-2005 Université Paul Cézanne Aix-Marseille III**
  Teaching assistantship
- **2001-2004 C.E.R.E.G.E., Aix-en-Provence, France**
  Ph.D. in Environmental Geosciences
- **2000-2001 University of Paris, Institut de Physique du Globe**
  M.S. of Fundamental and Applied Geochemistry

Web of Science®

These citation analyses were performed using ***Web of Science database*** only. This database is accessible on and off-campus.

Although this database covers a wide range of publications for this faculty member, it does not cover all of his scholarly activities. Other databases that may cover his publications significantly are: **GeoRef, GeoScienceWorld, SciFinder, Reaxys, INSPEC, Google Scholar,** etc.

Cited Papers from WOS

75 Publications — Citations: highest first — 1 of 2

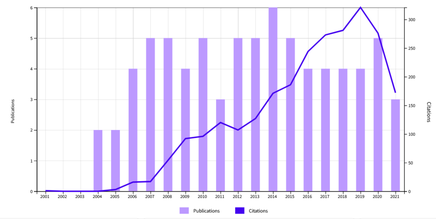
		Citations 2017	2018	2019	2020	2021	Average per year	Total
	Total	273	281	321	276	172	121.76	2,557
1	Transient liquid water and water activity at Gale crater on Mars Martín-Torres, FJ; Zorzano, MP; (...); Vaniman, D May 2015 | NATURE GEOSCIENCE 8 (5) , pp.357-361	32	32	36	44	12	28.29	198
2	A New Analysis of Mars "Special Regions": Findings of the Second MEPAG Special Regions Science Analysis Group (SR-SAG2) Rummel, JD; Beaty, DW; (...); Wray, JJ Nov 1 2014 | ASTROBIOLOGY 14 (11) , pp.887-968	28	30	36	25	19	22.75	182
3	Early geochemical environment of Mars as determined from thermodynamics of phyllosilicates Chevrier, V; Poulet, F and Bibring, JP Jul 5 2007 | NATURE 448 (7149) , pp.60-63	10	6	5	4	5	9.27	139
4	Mineralogy and evolution of the surface of Mars: A review Chevrier, V and Mathe, PE International Workshop on Planet Mars II Feb 2007 | PLANETARY AND SPACE SCIENCE 55 (3) , pp.289-314	9	8	9	9	4	7.53	113
5	Laboratory studies of perchlorate phase transitions: Support for metastable aqueous perchlorate solutions on Mars Gough, RV; Chevrier, VF; (...); Tolbert, MA Dec 15 2011 | EARTH AND PLANETARY SCIENCE LETTERS 312 (3-4) , pp.371-377	11	14	13	14	4	9.18	101
6	Methane clathrate hydrates as a potential source for martian atmospheric methane Chastain, BK and Chevrier, V Jul 2007 | PLANETARY AND SPACE SCIENCE 55 (10) , pp.1246-1256	11	5	9	3	3	6	90
7	Formation of recurring slope lineae by liquid brines on present-day Mars Chevrier, VF and Rivera-Valentin, EG Nov 16 2012 | GEOPHYSICAL RESEARCH LETTERS 39	10	16	12	12	10	8.8	88
8	Identification of the perchlorate parent salts at the Phoenix Mars landing site and possible implications Kounaves, SP; Chaniotakis, NA; (...); Weber, AW Apr 2014 | ICARUS 232 , pp.226-231	12	13	14	11	9	10.88	87
9	On the origin of gypsum in the Mars north polar region Fishbaugh, KE; Poulet, F; (...); Bibring, JP Jul 13 2007 | JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS 112 (E7)	3	8	11	4	4	5.33	80
10	Low temperature aqueous ferric sulfate solutions on the surface of Mars Chevrier, VF and Altheide, TS Nov 18 2008 | GEOPHYSICAL RESEARCH LETTERS 35 (22)	4	7	6	4	2	5.57	78
11	Matching Martian crustal magnetization and magnetic properties of Martian meteorites Rochette, P; Gattacceca, J; (...); Hochleitner, R Apr 2005 | METEORITICS & PLANETARY SCIENCE 40 (4) , pp.529-540	1	4	3	6	3	4.18	71

Journals and Impact (from ISI Journal Citation Reports)

Journal Title	Records	Category Name	Rank / Total Journals	Quartile
PLANETARY AND SPACE SCIENCE	12	ASTRONOMY & ASTROPHYSICS	44/79	Q3
ICARUS	11	ASTRONOMY & ASTROPHYSICS	21/79	Q2
GEOPHYSICAL RESEARCH LETTERS	9	GEOSCIENCES, MULTIDISCIPLINARY	19/235	Q1
JOURNAL OF GEOPHYSICAL RESEARCH PLANETS	9	GEOCHEMISTRY & GEOPHYSICS	23/88	Q2
EARTH AND PLANETARY SCIENCE LETTERS	6	GEOCHEMISTRY & GEOPHYSICS	7/88	Q1
GEOCHIMICA ET COSMOCHIMICA ACTA	4	GEOCHEMISTRY & GEOPHYSICS	9/88	Q1
METEORITICS PLANETARY SCIENCE	4	GEOCHEMISTRY & GEOPHYSICS	43/88	Q2
ASTROBIOLOGY	3	BIOLOGY	23/93	Q1
SPACE SCIENCE REVIEWS	3	ASTRONOMY & ASTROPHYSICS	7/68	Q1
ACS EARTH AND SPACE CHEMISTRY	2	GEOCHEMISTRY & GEOPHYSICS	32/88	Q2

Group Photo

Citation Snapshot from WOS



Citing Articles	Times Cited		29
1,588 Analyze Total	2,557 Total	34.09 Average per item	H-Index
1,531 Analyze Without self-citations	2,362 Without self-citations		

Research Areas from WOS

Research Areas	Record Count	% of 75
ASTRONOMY ASTROPHYSICS	35	46.7
GEOCHEMISTRY GEOPHYSICS	26	34.7
GEOLOGY	17	22.7
LIFE SCIENCES BIOMEDICINE OTHER TOPICS	3	4.0
CHEMISTRY	2	2.7
ENGINEERING	2	2.7
METEOROLOGY ATMOSPHERIC SCIENCES	2	2.7
SCIENCE TECHNOLOGY OTHER TOPICS	2	2.7
MINERALOGY	1	1.3

Types of Documents from WOS

Document Types	Record Count	% of 75
Articles	70	93.3
Proceedings Papers	8	10.7
Review Articles	3	4.0
Corrections	1	1.3
News Items	1	1.3

Recent Grants

1. V.F. Chevrier, J. Tullis, NASA (Mars Data Analysis Program), "Temporal and Geographical evolution of the South Pole CO_2-Ice Sublimation Pits", $321,679, July 2021 – June 2024,
2. V.F. Chevrier, S. Port, NASA (Solar System Workings), "An experimental investigation into the mineralogical effects of supercritical fluids on the Venusian crust", $417,441, January 2021 – December 2023
3. M.K. Hudson, V.F. Chevrier, NASA (EPSCoR, Rapid Response Research R3), "Stability and Distribution of Methane Clathrate Hydrates on the Surface of Mars - renewal", $100,000, November 2018 – November 2019.

Top Citing Countries

Country	# of Occurrence
USA	934
FRANCE	345
GERMANY	226
ENGLAND	183
SPAIN	123
CANADA	121
ITALY	117
SCOTLAND	78
PEOPLES R CHINA	70
NETHERLANDS	63

Top Citing Institutions

Institution	# of Occurrence
NATIONAL AERONAUTICS SPACE ADMINISTRATION NASA	363
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	274
NASA JET PROPULSION LABORATORY JPL	169
CALIFORNIA INSTITUTE OF TECHNOLOGY	168
NASA AMES RESEARCH CENTER	136
CNRS NATIONAL INSTITUTE FOR EARTH SCIENCES ASTRONOMY INSU	127
HELMHOLTZ ASSOCIATION	116
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS CSIC	103
SORBONNE UNIVERSITE	98
UNIVERSITE PARIS SACLAY	97
GERMAN AEROSPACE CENTRE DLR	84
UNIVERSITY OF ARKANSAS FAYETTEVILLE	84
UNIVERSITY OF CALIFORNIA SYSTEM	84

Top Citing Journals

Journal Title	# of Occurrence
ICARUS	238
JOURNAL OF GEOPHYSICAL RESEARCH PLANETS	149
ASTROBIOLOGY	114
PLANETARY AND SPACE SCIENCE	91
METEORITICS PLANETARY SCIENCE	76
EARTH AND PLANETARY SCIENCE LETTERS	55
GEOCHIMICA ET COSMOCHIMICA ACTA	55
GEOPHYSICAL RESEARCH LETTERS	53
INTERNATIONAL JOURNAL OF ASTROBIOLOGY	33
SPACE SCIENCE REVIEWS	23
AMERICAN MINERALOGIST	22
FRONTIERS IN MICROBIOLOGY	22
NATURE GEOSCIENCE	19
ACS EARTH AND SPACE CHEMISTRY	17
SCIENTIFIC REPORTS	17

Most Recent Publication

JGR Planets

RESEARCH ARTICLE

10.1029/2020JE006698

AGU ADVANCING EARTH AND SPACE SCIENCE

Carbonate-Phyllosilicate Parageneses and Environments of Aqueous Alteration in Nili Fossae and Mars

Vincent F. Chevrier[1] and Marietta Morisson[1]

[1]Arkansas Center for Space and Planetary Science, University of Arkansas, Fayetteville, AR, USA

The equilibrium thermodynamics of Fe/Mg-phyllosilicates and carbonates have been investigated using numerical modeling, with emphasis on the effects of evaporation and temperature (hydrothermalism) under conditions related to present-day and primitive Mars, that is, low or high CO_2 partial pressure, under oxidizing or reducing environments. Findings are discussed in relation to alteration and weathering of minerals found in the Nili Fossae region. Results show that nontronite precipitates at very high water-to-precipitate ratio and low temperature, in association with ferrihydrite. During evaporation, this assemblage leads to carbonates: calcite and magnesite, and to low temperature iron-rich serpentine phyllosilicates such as cronstedtite or berthierine under reducing conditions. At high temperature, the initial paragenesis dominated by nontronite leads to hematite and berthierine at low CO_2 partial pressure, and to talc, magnesite and antigorite at high CO_2 partial pressure. Thus, the Fe/Mg-smectites, Mg-carbonate, and Mg-serpentine found near Nili Fossae may result from several alteration events. Weathering of primitive bedrock formed nontronite, with subsequent or concurrent hydrothermalism leading to Mg-serpentine. Further carbonation due to CO_2-rich fluids led to ...

Top-Cited Papers

nature geoscience — LETTERS

PUBLISHED ONLINE: 13 APRIL 2015 | DOI: 10.1038/NGEO2412

Transient liquid water and water activity at Gale crater on Mars

F. Javier Martín-Torres[1,2*], María-Paz Zorzano[3], Patricia Valentín-Serrano[1,3], Ari-Matti Harri[4], Maria Genzer[4], Osku Kemppinen[4], Edgard G. Rivera-Valentín[5], Insoo Jun[6], James Wray[7], Morten Bo Madsen[8], Walter Goetz[9], Alfred S. McEwen[10], Craig Hardgrove[11], Nilton Renno[12], Vincent F. Chevrier[13], Michael Mischna[6], Rafael Navarro-González[14], Jesús Martínez-Frías[15], Pamela Conrad[16], Tim McConnochie[17], Charles Cockell[18], Gilles Berger[19], Ashwin R. Vasavada[6], Dawn Sumner[20] and David Vaniman[21]

Water is a requirement for life as we know it. Indirect evidence of transient liquid water has been observed from orbiter on equatorial Mars, in contrast with expectations from large-scale climate models. The presence of perchlorate salts, which have been detected at Gale crater on equatorial Mars by the Curiosity rover, lowers the freezing temperature of water. Moreover, perchlorates can form stable hydrated compounds and liquid solutions by absorbing atmospheric water vapor through deliquescence. Here we analyze relative humidity, air temperature and ground temperature data from the Curiosity rover at Gale crater and find that the observations support the formation of night-time transient liquid brines in the uppermost 5 cm of the subsurface that then evaporate after sunrise. We also find that changes in the hydration state of salts within the uppermost 15 cm of the subsurface, as measured by Curiosity, are consistent with an active exchange of water at the atmosphere–soil interface. However, the water activity and temperature are probably too low to support terrestrial organisms. Perchlorates are widespread on the surface of Mars and we expect that liquid brines are abundant beyond equatorial regions where atmospheric humidity is higher and temperatures are lower.

ASTROBIOLOGY
Volume 14, Number 11, 2014

DOI: 10.1089/ast.2014.1227

News & Views

A New Analysis of Mars "Special Regions": Findings of the Second MEPAG Special Regions Science Analysis Group (SR-SAG2)

John D. Rummel,[1] David W. Beaty,[2] Melissa A. Jones,[3] Corien Bakermans,[3] Nadine G. Barlow,[4] Penelope J. Boston,[5] Vincent F. Chevrier,[6] Benton C. Clark,[7] Jean-Pierre P. de Vera,[8] Raina V. Gough,[9] John E. Hallsworth,[10] James W. Head,[11] Victoria J. Hipkin,[12] Thomas L. Kieft,[5] Alfred S. McEwen,[13] Michael T. Mellon,[14] Jill A. Mikucki,[15] Wayne L. Nicholson,[16] Christopher R. Omelon,[17] Ronald Peterson,[18] Eric E. Roden,[19] Barbara Sherwood Lollar,[20] Kenneth L. Tanaka,[21] Donna Viola,[13] and James J. Wray[22]

A committee of the Mars Exploration Program Analysis Group (MEPAG) has reviewed and updated the description of Special Regions on Mars as places where terrestrial organisms might replicate (per the COSPAR Planetary Protection Policy). This review and update was conducted by an international team (SR-SAG2) drawn from both the biological science and Mars exploration communities, focused on understanding when and where Special Regions could occur. The study applied recently available data about martian environments and about terrestrial organisms, building on a previous analysis of Mars Special Regions (2006) undertaken by a similar team. Since then, a new body of highly relevant information has been generated from the Mars Reconnaissance Orbiter (launched in 2005) and Phoenix (2007) and data from Mars Express and the twin Mars Exploration Rovers (all 2003). Results have also been gleaned from the Mars Science Laboratory (launched in 2011). In addition to Mars data, there is a considerable body of new data regarding the known environmental limits to life on Earth—including the potential for terrestrial microbial life to survive and replicate under martian environmental conditions. The SR-SAG2 analysis has included an examination of new Mars models relevant to natural ...